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Ephemeris for Physical Observations of the Moon for 1902.

By A. C. D. Crommelin.

Greenwich Midnight.	Selenographical Colong. of the Sun	Lat. of the Sun	Geocentric Libration Sel. Long. of the Earth	Geocentric Libration Lat. of the Earth	Geocentric Libration Combined Amount.	Geocentric Libration Direction.	C.
1902.	°	°	°	°	°	°	°
Jan. 1	178·16	+1·33	+5·41	+3·03	6·20	299·3	24·28
2	190·32	1·34	+4·18	+1·73	4·52	292·5	22·83
3	202·49	1·35	+2·80	+0·38	2·83	277·7	20·39
4	214·66	1·36	+1·36	−0·98	1·68	234·2	17·06
5	226·84	1·37	−0·06	−2·30	2·30	178·5	12·93
6	239·02	1·38	−1·38	−3·53	3·79	158·6	8·16
7	251·20	1·39	−2·55	−4·61	5·27	151·1	2·95
8	263·39	1·40	−3·53	−5·50	6·54	147·3	357·57
9	275·58	1·41	−4·29	−6·14	7·49	145·1	352·26
10	287·77	1·42	−4·84	−6·50	8·11	143·3	347·33
11	299·96	1·43	−5·18	−6·54	8·35	141·6	343·00
12	312·14	1·44	−5·33	−6·24	8·21	139·5	339·49
13	324·32	1·45	−5·31	−5·61	7·72	136·6	336·95
14	336·50	1·46	−5·11	−4·66	6·92	132·4	335·54
15	348·67	1·47	−4·74	−3·44	5·86	126·0	335·39
16	0·83	1·48	−4·19	−2·01	4·65	115·6	336·59
17	12·99	1·48	−3·43	−0·43	3·46	97·1	339·20
18	25·13	1·49	−2·47	+1·19	2·74	64·3	343·16
19	37·27	1·50	−1·30	+2·76	3·05	25·2	348·34
20	49·41	1·51	+0·04	+4·17	4·17	359·4	354·38
21	61·54	1·52	+1·46	+5·31	5·51	344·6	0·82
22	73·66	1·52	+2·87	+6·09	6·73	334·8	7·11
23	85·79	1·53	+4·15	+6·48	7·69	327·4	12·79
24	97·91	1·53	+5·17	+6·47	8·28	321·4	17·51
25	110·04	1·53	+5·82	+6·07	8·41	316·2	21·09
26	122·18	1·53	+6·06	+5·34	8·08	311·4	23·44
27	134·31	1·53	+5·88	+4·35	7·31	306·5	24·58
28	146·46	1·53	+5·28	+3·17	6·16	301·0	24·56
29	158·61	1·53	+4·34	+1·87	4·73	293·3	23·42
30	170·77	1·52	+3·15	+0·52	3·19	279·4	21·28
31	182·93	1·52	+1·80	−0·84	1·99	245·0	18·20
Feb. 1	195·10	1·52	+0·38	−2·16	2·19	190·0	14·29
2	207·27	1·51	−1·00	−3·39	3·53	163·6	9·72
3	219·45	1·51	−2·26	−4·48	5·02	153·2	4·65
4	231·63	+1·50	−3·22	−5·39	6·28	149·1	359·30

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Greenwich Midnight.		Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Geocentric Libration Direction.	C.
1902.		°	°	°	°	°	°	°
Feb.	5	243·82	+1·50	−4·14	−6·06	7·34	145·7	353·94
	6	256·01	1·49	−4·68	−6·45	7·97	144·0	348·82
	7	268·20	1·49	−4·94	−6·53	8·19	142·9	344·22
	8	280·40	1·48	−4·93	−6·26	7·97	141·8	340·38
	9	292·60	1·48	−4·69	−5·65	7·34	140·3	337·49
	10	304·79	1·47	−4·27	−4·71	6·36	137·8	335·75
	11	316·98	1·47	−3·72	−3·49	5·10	133·2	335·29
	12	329·16	1·47	−3·06	−2·06	3·69	124·0	336·21
	13	341·34	1·46	−2·33	−0·48	2·38	101·6	338·51
	14	353·52	1·46	−1·53	+1·13	1·90	53·6	342·16
	15	5·69	1·45	−0·65	+2·68	2·76	13·6	346·99
	16	17·85	1·45	+0·29	+4·07	4·08	355·9	352·70
	17	30·00	1·44	+1·28	+5·21	5·36	346·2	358·80
	18	42·15	1·43	+2·27	+6·03	6·44	339·4	5·11
	19	54·29	1·42	+3·22	+6·48	7·23	333·6	10·89
	20	66·43	1·41	+4·05	+6·54	7·69	328·2	15·88
	21	78·56	1·40	+4·67	+6·21	7·78	323·1	19·86
	22	90·70	1·38	+5·01	+5·55	7·48	317·9	22·68
	23	102·84	1·37	+5·03	+4·59	6·81	312·1	24·21
	24	114·98	1·35	+4·71	+3·42	5·82	306·0	24·72
	25	127·13	1·34	+4·04	+2·11	4·56	297·6	23·97
	26	139·29	1·32	+3·09	+0·72	3·17	283·1	22·14
	27	151·44	1·30	+1·91	−0·67	2·02	250·7	19·34
	28	163·61	1·28	+0·59	−2·02	2·10	196·3	15·69
Mar.	1	175·78	1·27	−0·80	−3·28	3·38	166·3	11·31
	2	187·95	1·25	−2·15	−4·40	4·90	154·0	6·40
	3	200·14	1·23	−3·38	−5·34	6·32	147·7	1·14
	4	212·32	1·21	−4·40	−6·06	7·49	144·0	355·82
	5	224·51	1·20	−5·14	−6·51	8·30	141·7	350·63
	6	236·71	1·18	−5·56	−6·65	8·67	140·1	345·83
	7	248·91	1·16	−5·63	−6·46	8·57	138·9	341·66
	8	261·12	1·14	−5·36	−5·91	7·98	137·8	338·38
	9	273·33	1·13	−4·78	−5·01	6·93	136·3	336·19
	10	285·54	1·11	−3·96	−3·79	5·48	133·7	335·28
	11	297·75	1·10	−2·98	−2·33	3·78	128·0	335·78
	12	309·96	1·08	−1·90	−0·70	2·03	110·2	337·76
	13	322·16	1·07	−0·78	+0·97	1·25	38·8	341·16
	14	334·36	+1·05	+0·31	+2·58	2·60	353·1	345·82

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Greenwich Midnight.	Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Geocentric Libration Direction.	C.
1902.	°	°	°	°	°	°	°
Mar. 15	346·55	+1·03	+1·36	+4·03	4·25	341·4	351·41
16	358·73	1·01	+2·31	+5·21	5·70	336·1	357·52
17	10·91	0·99	+3·16	+6·08	6·85	332·5	3·69
18	23·08	0·97	+3·87	+6·57	7·63	329·5	9·51
19	35·24	0·95	+4·44	+6·69	8·03	326·4	14·63
20	47·40	0·93	+4·82	+6·43	8·04	323·1	18·82
21	59·56	0·90	+4·98	+5·82	7·66	319·4	21·95
22	71·71	0·88	+4·90	+4·91	6·93	315·1	23·92
23	83·87	0·85	+4·57	+3·77	5·92	309·5	24·73
24	96·03	0·83	+3·97	+2·46	4·67	301·8	24·37
25	108·19	0·80	+3·13	+1·06	3·30	288·7	22·89
26	120·35	0·77	+2·08	−0·38	2·11	259·6	20·39
27	132·52	0·75	+0·86	−1·77	1·97	205·9	16·97
28	144·69	0·72	−0·48	−3·08	3·12	171·1	12·80
29	156·87	0·69	−1·85	−4·26	4·65	156·5	8·04
30	169·05	0·66	−3·18	−5·25	6·14	148·8	2·91
31	181·24	0·64	−4·40	−6·03	7·46	143·9	357·64
Apr. 1	193·43	0·61	−5·42	−6·55	8·50	140·4	352·43
2	205·63	0·59	−6·17	−6·78	9·17	137·7	347·54
3	217·83	0·56	−6·59	−6·69	9·39	135·4	343·17
4	230·04	0·54	−6·63	−6·25	9·11	133·3	339·57
5	242·26	0·51	−6·27	−5·46	8·31	131·0	336·92
6	254·48	0·49	−5·53	−4·33	7·03	128·1	335·47
7	266·71	0·47	−4·45	−2·90	5·31	123·1	335·39
8	278·93	0·45	−3·12	−1·26	3·36	112·0	336·82
9	291·16	0·42	−1·61	+0·48	1·68	73·4	339·81
10	303·39	0·40	−0·05	+2·20	2·20	1·3	344·21
11	315·61	0·38	+1·47	+3·77	4·05	338·7	349·74
12	327·83	0·35	+2·85	+5·07	5·81	330·7	355·93
13	340·03	0·33	+4·04	+6·04	7·27	326·2	2·26
14	352·23	0·30	+4·96	+6·61	8·27	323·1	8·26
15	4·43	0·28	+5·60	+6·80	8·81	320·5	13·59
16	16·62	0·25	+5·96	+6·60	8·89	317·9	17·98
17	28·80	0·22	+6·03	+6·05	8·54	315·1	21·33
18	40·98	0·19	+5·82	+5·20	7·81	311·8	23·57
19	53·16	0·16	+5·36	+4·10	6·75	307·4	24·65
20	65·34	0·13	+4·67	+2·83	5·47	301·3	24·59
21	77·51	+0·10	+3·77	+1·44	4·04	290·9	23·43

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Greenwich Midnight.	Selenographical		Geocentric Libration				
	Colong. of the Sun.	Lat.	Sel. Long. of the Earth.	Lat.	Combined Amount.	Direction.	C.
1902.	°	°	°	°	°	°	°
Apr. 22	89·68	+0·07	+2·71	0·00	2·71	270·0	21·24
23	101·86	0·04	+1·51	−1·43	2·08	226·6	18·08
24	114·04	+0·01	+0·22	−2·77	2·78	184·5	14·10
25	126·22	−0·02	−1·14	−4·00	4·16	164·1	9·49
26	138·40	0·05	−2·49	−5·05	5·63	153·8	4·45
27	150·59	0·08	−3·80	−5·88	7·00	147·1	359·21
28	162·78	0·11	−5·00	−6·47	8·18	142·3	354·00
29	174·98	0·14	−6·03	−6·79	9·08	138·4	349·05
30	187·18	0·16	−6·81	−6·79	9·61	134·9	344·58
May 1	199·39	0·19	−7·29	−6·48	9·75	131·6	340·76
2	211·61	0·22	−7·41	−5·82	9·42	128·1	337·80
3	223·83	0·24	−7·12	−4·83	8·60	124·1	335·89
4	236·06	0·26	−6·41	−3·53	7·31	118·8	335·22
5	248·30	0·29	−5·29	−1·98	5·65	110·5	335·99
6	260·54	0·31	−3·82	−0·25	3·83	93·7	338·32
7	272·78	0·33	−2·07	+1·52	2·57	53·7	342·20
8	285·03	0·36	−0·18	+3·19	3·20	3·2	347·43
9	297·27	0·38	+1·72	+4·65	4·96	339·7	353·61
10	309·50	0·40	+3·48	+5·76	6·73	328·9	0·18
11	321·74	0·42	+4·97	+6·48	8·17	322·5	6·54
12	333·96	0·45	+6·11	+6·77	9·12	317·9	12·26
13	346·18	0·47	+6·85	+6·66	9·55	314·2	17·02
14	358·39	0·50	+7·16	+6·17	9·46	310·8	20·67
15	10·60	0·52	+7·09	+5·37	8·89	307·1	23·18
16	22·80	0·55	+6·68	+4·33	7·96	302·9	24·52
17	35·00	0·58	+5·96	+3·09	6·71	297·4	24·73
18	47·19	0·61	+5·02	+1·74	5·31	289·1	23·83
19	59·38	0·64	+3·89	+0·32	3·90	274·7	21·89
20	71·57	0·67	+2·65	−1·09	2·87	247·6	18·99
21	83·76	0·70	+1·33	−2·45	2·79	208·5	15·21
22	95·95	0·72	−0·02	−3·69	3·69	179·7	10·74
23	108·14	0·75	−1·38	−4·77	4·96	163·9	5·78
24	120·33	0·77	−2·69	−5·65	6·26	154·5	0·56
25	132·52	0·80	−3·94	−6·29	7·43	147·9	355·34
26	144·72	0·82	−5·08	−6·66	8·37	142·7	350·31
27	156·92	0·85	−6·05	−6·73	9·05	138·0	345·74
28	169·13	0·87	−6·84	−6·50	9·43	133·5	341·78
29	181·34	−0·89	−7·36	−5·95	9·47	129·0	338·60

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1902.	°	°	°	°	°	°	°
May 30	193·55	−0·91	−7·57	−5·09	9·12	123·9	336·39
31	205·78	0·93	−7·41	−3·93	8·38	117·9	335·29
June 1	218·01	0·95	−6·86	−2·52	7·31	110·2	335·49
2	230·25	0·96	−5·87	−0·91	5·94	98·8	337·12
3	242·49	0·98	−4·48	+0·81	4·55	79·8	340·29
4	254·74	1·00	−2·73	+2·50	3·70	47·5	344·94
5	266·99	1·01	−0·74	+4·04	4·11	10·4	350·80
6	279·25	1·03	+1·33	+5·30	5·47	345·9	357·37
7	291·50	1·05	+3·32	+6·17	7·01	331·7	4·06
8	303·75	1·07	+5·06	+6·61	8·32	322·6	10·26
9	315·99	1·08	+6·42	+6·61	9·22	315·8	15·56
10	328·23	1·10	+7·30	+6·20	9·57	310·3	19·70
11	340·46	1·12	+7·69	+5·46	9·43	305·4	22·63
12	352·68	1·14	+7·61	+4·45	8·81	300·3	24·31
13	4·90	1·16	+7·13	+3·24	7·83	294·4	24·80
14	17·11	1·18	+6·31	+1·91	6·59	286·8	24·15
15	29·32	1·20	+5·23	+0·53	5·26	275·8	22·46
16	41·52	1·22	+3·99	−0·87	4·08	257·7	19·77
17	53·73	1·24	+2·65	−2·21	3·45	230·2	16·20
18	65·92	1·26	+1·26	−3·45	3·67	200·1	11·90
19	78·12	1·27	−0·10	−4·54	4·54	178·7	7·03
20	90·31	1·29	−1·41	−5·44	5·62	165·5	1·85
21	102·51	1·31	−2·63	−6·10	6·64	156·7	356·57
22	114·70	1·32	−3·76	−6·50	7·51	149·9	351·46
23	126·90	1·34	−4·75	−6·61	8·14	144·3	346·74
24	139·10	1·35	−5·60	−6·42	8·52	138·9	342·63
25	151·31	1·36	−6·28	−5·92	8·63	133·3	339·27
26	163·51	1·37	−6·76	−5·13	8·49	127·2	336·83
27	175·72	1·38	−6·98	−4·06	8·08	120·2	335·46
28	187·94	1·39	−6·91	−2·75	7·51	113·1	335·27
29	200·17	1·40	−6·50	−1·25	6·62	100·9	336·41
30	212·40	1·41	−5·70	+0·36	5·71	86·4	338·95
July 1	224·64	1·41	−4·52	+1·99	4·94	66·2	342·92
2	236·89	1·42	−2·97	+3·52	4·61	40·2	348·21
3	249·14	1·42	−1·13	+4·84	4·97	13·1	354·46
4	261·40	1·43	+0·86	+5·83	5·89	351·6	1·15
5	273·66	1·44	+2·83	+6·40	7·00	336·1	7·68
6	285·91	−1·45	+4·61	+6·53	7·99	324·8	13·51

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	Colong. of the Sun.	Lat. of the Sun.	Sel. Long. of the Earth.	Lat. of the Earth.	Combined Amount.	Direction.	
1902.	°	°	°	°	°	°	°
July 7	298·16	−1·45	+6·03	+6·23	8·68	315·9	18·25
8	310·41	1·46	+7·00	+5·55	8·93	308·4	21·74
9	322·65	1·47	+7·47	+4·57	8·76	301·5	23·90
10	334·88	1·48	+7·44	+3·38	8·17	294·4	24·79
11	347·11	1·49	+6·97	+2·05	7·26	286·4	24·47
12	359·33	1·49	+6·14	+0·65	6·17	276·0	23·02
13	11·55	1·50	+5·05	−0·74	5·10	261·7	20·56
14	23·76	1·51	+3·77	−2·08	4·31	241·1	17·20
15	35·97	1·51	+2·41	−3·32	4·10	216·0	13·07
16	48·18	1·52	+1·04	−4·41	4·53	193·3	8·33
17	60·38	1·52	−0·28	−5·31	5·32	177·0	3·20
18	72·58	1·53	−1·51	−5·99	6·18	165·8	357·91
19	84·77	1·53	−2·60	−6·41	6·92	157·9	352·70
20	96·96	1·53	−3·55	−6·54	7·44	151·5	347·83
21	109·16	1·53	−4·33	−6·37	7·70	145·8	343·50
22	121·35	1·53	−4·97	−5·89	7·71	139·8	339·94
23	133·54	1·53	−5·43	−5·12	7·46	133·3	337·27
24	145·74	1·53	−5·72	−4·08	7·03	125·5	335·65
25	157·94	1·53	−5·82	−2·81	6·46	115·8	335·19
26	170·15	1·52	−5·70	−1·36	5·86	103·4	335·99
27	182·36	1·52	−5·31	+0·19	5·31	88·0	338·13
28	194·58	1·51	−4·64	+1·77	4·97	69·1	341·61
29	206·81	1·51	−3·65	+3·26	4·90	48·2	346·35
30	219·05	1·50	−2·36	+4·58	5·15	27·3	352·13
31	231·29	1·49	−0·83	+5·61	5·67	8·4	358·54
Aug. 1	243·53	1·49	+0·86	+6·28	6·34	352·2	5·07
2	255·79	1·48	+2·56	+6·52	7·00	338·6	11·19
3	268·04	1·48	+4·11	+6·33	7·55	327·0	16·42
4	280·29	1·47	+5·39	+5·73	7·86	316·8	20·49
5	292·54	1·47	+6·28	+4·80	7·91	307·4	23·22
6	304·78	1·47	+6·71	+3·61	7·62	298·3	24·62
7	317·02	1·46	+6·69	+2·26	7·06	288·7	24·73
8	329·25	1·46	+6·25	+0·84	6·31	277·7	23·62
9	341·48	1·45	+5·44	−0·59	5·47	263·8	21·43
10	353·70	1·45	+4·38	−1·96	4·80	245·9	18·29
11	5·92	1·44	+3·13	−3·23	4·50	224·1	14·33
12	18·13	1·43	+1·79	−4·35	4·71	202·4	9·75
13	30·33	−1·43	+0·46	−5·28	5·30	185·0	4·71

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Greenwich Midnight.		Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration: Sel. Long. of the Earth.	Geocentric Libration: Lat. of the Earth.	Geocentric Libration: Combined Amount.	Geocentric Libration: Direction.	C.
1902.								
Aug.	14	42°·53	−1°·42	−0°·80	−5°·98	6°·03	172°·4	359°·45
	15	54·72	1·41	−1·93	−6·43	6·71	163·3	354·18
	16	66·92	1·40	−2·88	−6·59	7·19	156·4	349·17
	17	79·10	1·39	−3·65	−6·45	7·41	150·5	344·64
	18	91·29	1·37	−4·19	−6·00	7·32	145·1	340·80
	19	103·47	1·36	−4·55	−5·24	6·94	139·0	337·84
	20	115·65	1·34	−4·70	−4·20	6·31	131·8	335·92
	21	127·84	1·33	−4·68	−2·92	5·52	122·0	335·17
	22	140·03	1·31	−4·49	−1·46	4·72	108·0	335·70
	23	152·22	1·29	−4·13	+0·10	4·13	88·6	337·55
	24	164·42	1·27	−3·59	+1·68	3·96	64·9	340·72
	25	176·62	1·26	−2·87	+3·18	4·29	42·1	345·13
	26	188·83	1·24	−1·96	+4·50	4·91	23·5	350·56
	27	201·04	1·22	−0·88	+5·56	5·63	9·0	356·68
	28	213·27	1·20	+0·35	+6·28	6·29	356·8	3·05
	29	225·50	1·19	+1·64	+6·60	6·80	346·0	91·8
	30	237·73	1·17	+2·92	+6·50	7·13	335·8	14·63
	31	249·97	1·15	+4·08	+6·00	7·26	325·8	19·09
Sept.	1	262·22	1·14	+4·98	+5·14	7·16	315·9	22·32
	2	274·46	1·12	+5·59	+3·98	6·87	305·5	24·25
	3	286·70	1·11	+5·83	+2·63	6·40	294·3	24·84
	4	298·93	1·09	+5·70	+1·18	5·82	281·7	24·17
	5	311·16	1·08	+5·21	−0·31	5·22	266·6	22·33
	6	323·38	1·06	+4·41	−1·74	4·74	248·5	19·46
	7	335·60	1·04	+3·36	−3·07	4·55	227·6	15·72
	8	347·81	1·02	+2·15	−4·24	4·75	206·9	11·29
	9	0·02	1·01	+0·83	−5·23	5·30	189·0	6·35
	10	12·22	0·99	−0·46	−5·99	6·01	175·6	1·14
	11	24·41	0·97	−1·68	−6·49	6·70	165·5	355·87
	12	36·61	0·95	−2·76	−6·72	7·26	157·7	350·78
	13	48·79	0·93	−3·63	−6·64	7·57	151·3	346·07
	14	60·97	0·90	−4·25	−6·25	7·56	145·8	341·98
	15	73·15	0·88	−4·60	−5·55	7·21	140·3	338·69
	16	85·32	0·85	−4·69	−4·53	6·52	134·0	336·39
	17	97·49	0·83	−4·51	−3·26	5·57	125·9	335·25
	18	109·65	0·80	−4·11	−1·78	4·48	113·4	335·40
	19	121·82	0·77	−3·50	−0·17	3·50	92·8	336·93
	20	133·99	−0·75	−2·74	+1·47	3·11	61·8	339·84

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1902.		°	°	°	°	°	°	°
Sept.	21	146·17	−0·72	−1·86	+3·04	3·57	31·5	341·04
	22	158·35	0·69	−0·89	+4·42	4·51	11·4	349·31
	23	170·53	0·66	+0·14	+5·54	5·54	358·6	355·30
	24	182·73	0·64	+1·18	+6·31	6·42	349·4	1·58
	25	194·93	0·61	+2·21	+6·70	7·06	341·7	7·70
	26	207·14	0·59	+3·16	+6·68	7·39	334·7	13·24
	27	219·35	0·56	+4·01	+6·27	7·44	327·4	17·90
	28	231·57	0·54	+4·67	+5·49	7·21	319·6	21·45
	29	243·79	0·52	+5·13	+4·40	6·76	310·6	23·75
	30	256·01	0·50	+5·32	+3·09	6·15	300·2	24·79
Oct.	1	268·24	0·47	+5·24	+1·64	5·49	287·4	24·56
	2	280·46	0·45	+4·88	+0·13	4·88	271·5	23·12
	3	292·68	0·43	+4·25	−1·34	4·46	252·5	20·59
	4	304·90	0·40	+3·37	−2·75	4·35	230·8	17·10
	5	317·11	0·38	+2·29	−4·00	4·61	209·8	12·84
	6	329·32	0·35	+1·08	−5·06	5·18	192·1	8·03
	7	341·52	0·33	−0·22	−5·89	5·89	177·9	2·88
	8	353·72	0·30	−1·51	−6·48	6·65	166·9	357·62
	9	5·91	0·28	−2·74	−6·78	7·31	158·0	352·48
	10	18·09	0·25	−3·83	−6·80	7·81	150·6	347·67
	11	30·27	0·22	−4·69	−6·50	8·01	144·2	343·38
	12	42·45	0·19	−5·29	−5·90	7·93	138·1	339·81
	13	54·61	0·16	−5·57	−4·98	7·47	131·8	337·12
	14	66·77	0·13	−5·51	−3·78	6·68	124·4	335·52
	15	78·93	0·10	−5·09	−2·34	5·60	114·7	335·17
	16	91·08	0·07	−4·35	−0·72	4·41	99·4	336·21
	17	103·23	0·04	−3·32	+0·97	3·46	73·7	338·69
	18	115·38	−0·01	−2·18	+2·63	3·42	39·7	342·60
	19	127·53	+0·03	−0·72	+4·12	4·18	9·9	347·73
	20	139·69	0·06	+0·68	+5·35	5·39	352·8	353·73
	21	151·85	0·09	+2·02	+6·23	6·55	342·0	0·11
	22	164·02	0·12	+3·23	+6·70	7·44	334·3	6·38
	23	176·19	0·15	+4·24	+6·76	7·98	327·9	12·11
	24	188·38	0·17	+5·03	+6·42	8·16	321·9	16·95
	25	200·57	0·20	+5·55	+5·72	7·97	315·9	20·72
	26	212·76	0·22	+5·82	+4·70	7·48	308·9	23·31
	27	224·96	0·25	+5·84	+3·46	6·79	300·7	24·66
	28	237·16	+0·27	+5·61	+2·05	5·97	290·1	24·77

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Greenwich Midnight.	Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Geocentric Libration Direction.	C.
1902.	°	°	°	°	°	°	°
Oct. 29	249·37	+0·30	+5·15	+0·57	5·18	276·3	23·69
30	261·58	0·32	+4·49	−0·92	4·58	258·4	21·51
31	273·78	0·34	+3·64	−2·35	4·33	237·2	18·31
Nov. 1	285·99	0·37	+2·63	−3·65	4·50	215·8	14·28
2	298·19	0·39	+1·48	−4·77	4·99	197·2	9·60
3	310·39	0·42	+0·24	−5·67	5·68	182·4	4·51
4	322·58	0·44	−1·06	−6·32	6·41	170·5	359·37
5	334·77	0·47	−2·37	−6·70	7·11	160·5	354·07
6	346·96	0·49	−3·62	−6·80	7·70	152·0	349·17
7	359·14	0·52	−4·75	−6·60	8·13	144·3	344·76
8	11·31	0·55	−5·69	−6·11	8·35	137·0	340·98
9	23·48	0·58	−6·37	−5·32	8·30	129·9	338·02
10	35·64	0·60	−6·73	−4·25	7·96	122·3	336·02
11	47·80	0·63	−6·69	−2·92	7·30	113·6	335·14
12	59·94	0·66	−6·23	−1·39	6·38	102·6	335·57
13	72·08	0·69	−5·33	+0·27	5·34	87·1	337·43
14	84·22	0·72	−4·04	+1·96	4·49	64·1	340·77
15	96·35	0·75	−2·42	+3·55	4·30	34·3	345·44
16	108·48	0·78	−0·60	+4·91	4·95	7·0	351·41
17	120·62	0·80	+1·27	+5·93	6·07	347·9	357·94
18	132·76	0·83	+3·05	+6·54	7·22	335·0	4·53
19	144·90	0·85	+4·59	+6·70	8·12	325·6	10·65
20	157·05	0·87	+5·79	+6·44	8·67	318·0	15·87
21	169·21	0·90	+6·61	+5·80	8·80	311·3	19·97
22	181·38	0·92	+7·03	+4·84	8·53	304·5	22·85
23	193·56	0·94	+7·08	+3·65	7·97	297·3	24·47
24	205·74	0·96	+6·80	+2·29	7·17	288·6	24·86
25	217·92	0·98	+6·25	+0·85	6·31	277·7	24·08
26	230·10	0·99	+5·48	−0·61	5·51	263·6	22·17
27	242·29	1·01	+4·54	−2·02	4·97	246·0	19·25
28	254·49	1·03	+3·48	−3·32	4·81	226·4	15·46
29	266·68	1·05	+2·32	−4·46	5·03	207·5	10·95
30	278·87	1·07	+1·08	−5·39	5·50	191·3	5·96
Dec. 1	291·06	1·08	−0·20	−6·09	6·09	178·1	0·71
2	303·25	1·10	−1·50	−6·52	6·69	167·0	355·48
3	315·44	1·12	−2·80	−6·67	7·23	157·2	350·48
4	327·62	1·14	−4·04	−6·53	7·68	148·3	345·94
5	339·79	+1·16	−5·20	−6·11	8·02	139·6	342·01

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Greenwich Midnight.	Selenographical Colong. of the Sun.	Selenographical Lat. of the Sun.	Geocentric Libration Sel. Long. of the Earth.	Geocentric Libration Lat. of the Earth.	Geocentric Libration Combined Amount.	Geocentric Libration Direction.	C.
1902. Dec. 6	351°·97	+1°·18	−6°·21	−5°·41	8°·24	131°·1	338°·84
7	4·13	1·20	−6·99	−4·45	8·29	122·5	336·57
8	16·29	1·22	−7·48	−3·25	8·16	113·5	335·31
9	28·44	1·24	−7·60	−1·84	7·82	103·6	335·23
10	40·59	1·26	−7·28	−0·29	7·29	92·3	336·44
11	52·73	1·28	−6·47	+1·33	6·61	78·4	339·07
12	64·86	1·29	−5·18	+2·91	5·94	60·7	343·15
13	76·99	1·31	−3·46	+4·34	5·55	38·6	348·56
14	89·11	1·33	−1·41	+5·49	5·67	14·4	354·93
15	101·23	1·35	+0·77	+6·25	6·30	353·0	1·72
16	113·35	1·36	+2·91	+6·56	7·17	336·1	8·31
17	125·48	1·37	+4·80	+6·41	8·01	323·2	14·13
18	137·62	1·39	+6·29	+5·83	8·58	312·8	18·81
19	149·76	1·40	+7·31	+4·91	8·81	303·9	22·18
20	161·91	1·41	+7·83	+3·73	8·68	295·5	24·18
21	174·06	1·41	+7·87	+2·39	8·23	286·9	24·89
22	186·22	1·42	+7·50	+0·96	7·56	277·3	24·36
23	198·39	1·43	+6·81	−0·48	6·83	266·0	22·69
24	210·56	1·43	+5·87	−1·87	6·16	252·3	20·00
25	222·74	1·44	+4·76	−3·16	5·72	236·4	16·43
26	234·92	1·45	+3·54	−4·29	5·56	219·5	12·10
27	247·10	1·45	+2·26	−5·22	5·69	203·4	7·23
28	259·29	1·46	+0·97	−5·93	6·01	189·3	2·04
29	271·47	1·47	−0·33	−6·37	6·38	177·0	356·77
30	283·66	1·47	−1·60	−6·55	6·74	166·3	351·68
31	295·85	1·48	−2·83	−6·43	7·03	156·2	346·99
1903. Jan. 1	308·03	+1·48	−4·01	−6·04	7·25	146·4	342·88

The longitudes are reckoned in the plane of the Moon's equator, the axis of reference being the radius which passes through the mean centre of the visible disc. This axis therefore rotates with the Moon, and is not fixed in space.

The inclination of the Moon's equator to the ecliptic is taken as 1°·523, the value used in the *Connaissance des Temps*, that given by the *Nautical Almanac* being 1°·536.

The physical librations in longitude and latitude, as given by Professor Franz's formulæ, have been applied; their values are taken from the *Berliner Jahrbuch* for the days given there, and interpolated by a graphical method for the other days. But the signs in the *Jahrbuch* require to be reversed in order to reduce to the system used here.

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The colongitude of the Sun is 90° (or 450°) *minus* his selenographical longitude. It also is the selenographical longitude of the morning terminator reckoned eastward from the mean centre of the disc. Hence its value is approximately 270°, 0°, 90°, 180° at new Moon, first quarter, full Moon, last quarter respectively. The longitude of the evening terminator is of course 180° greater or less than that of the morning one.

When the geocentric libration in longitude is positive, the region brought into view is on the west limb; when negative, on the east.

When the geocentric libration in latitude is positive, the region brought into view is at the Moon's north pole; when negative, at the south.

The column "Combined Amount" gives the distance between the apparent and mean centres of the disc, and the column "Direction" gives the position-angle of the apparent centre from the mean centre, or, which is the same thing, the position-angle of the region which is most carried into view by libration. The angles are reckoned eastward from the northern extremity of the Moon's axis.

C denotes the geocentric position-angle of the northern extremity of the Moon's axis measured eastward from the northernmost point of the disc. It has been computed by the second formula given in the Preface to the *Nautical Almanac*, but the co-ordinates of the Moon's equator have been taken from the *Connaissance des Temps*, so as to make this column consistent with the rest of the ephemeris.

The terms "East" and "West" are used throughout with reference to our sky, and not as they would appear to an observer on the Moon.

I give the method for finding the altitude of the Sun at a given point on the Moon whose position is defined: (1) by selenographical longitude and latitude; (2) by direction cosines.

In either case the Sun's selenographical colongitude and latitude (K, L supposed) must be found by interpolation from the ephemeris for the given time.

In the first case let the given point be in the position longitude M, latitude N. Longitudes are reckoned from the meridian passing through the mean centre of the disc, and the positive direction is that towards Mare Crisium. North latitudes are considered positive.

Then

$$\text{sine Sun's altitude} = \sin L \sin N + \cos L \cos N \sin (K + M).$$

In the second case let ξ, η, ζ be the direction cosines of the given point. The axes are (1) that diameter of the Moon's equator which is 90° from the mean centre of the disc; (2) the Moon's polar axis; (3) the diameter through the mean centre of the disc. The positive directions are as above. Mr. Saunder

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has issued some maps of portions of the Moon's surface from which the co-ordinates ξ, η, ζ can be taken at sight.

Then the Sun's direction cosines are :

$$\cos K \cos L, \sin L, \sin K \cos L,$$

and sine Sun's altitude

$$= \xi \cos K \cos L + \eta \sin L + \zeta \sin K \cos L.$$

Neither formula is convenient when the Sun's altitude is very great, for an angle near 90° cannot be accurately determined from its sine. However, when the Sun is high the shadows are so inconspicuous that it is not necessary to compute his altitude with great accuracy.

Benvenue, 55 *Ulundi Road, Blackheath, S.E.*
1901 *September* 21.

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Ephemeris for Physical Observations of

Greenwich Noon.	P.	L−O.	B.	Apparent Diameter.			*d.*	Q.	B′.
				Equat. 2*a*.	Defect.	Polar 2*b*.			
1902.	°	°	°	″	″	″	°	°	°
Feb. 21	344·765	167·836	−0·822	33·46	0·07	31·31	5·31	255·90	−0·88
23	344·604	168·275	−0·803	33·55	·08	31·39	5·57	255·78	−0·86
25	344·446	168·712	−0·785	33·65	·09	31·48	5·84	255·66	−0·84
27	344·290	169·145	−0·767	33·74	·10	31·57	6·10	255·54	−0·82
Mar. 1	344·137	169·573	−0·749	33·85	·10	31·67	6·36	255·42	−0·80
3	343·987	169·999	−0·731	33·96	·11	31·77	6·61	255·31	−0·78
5	343·839	170·420	−0·713	34·07	·12	31·87	6·86	255·19	−0·76
7	343·694	170·837	−0·695	34·19	·13	31·98	7·11	255·08	−0·74
9	343·551	171·249	−0·677	34·31	·14	32·10	7·35	254·97	−0·72
11	343·410	171·656	−0·659	34·44	·15	32·22	7·59	254·86	−0·70
13	343·272	172·059	−0·641	34·58	·16	32·35	7·82	254·75	−0·68
15	343·137	172·456	−0·623	34·72	·17	32·48	8·04	254·64	−0·67
17	343·004	172·849	−0·605	34·86	·18	32·61	8·27	254·54	−0·65
19	342·874	173·234	−0·587	34·99	·19	32·74	8·48	254·43	−0·63
21	342·748	173·615	−0·570	35·14	·20	32·87	8·69	254·33	−0·61
23	342·624	173·990	−0·552	35·29	·21	33·02	8·89	254·23	−0·59
25	342·502	174·358	−0·535	35·45	·22	33·17	9·09	254·13	−0·57
27	342·383	174·720	−0·517	35·62	·23	33·33	9·28	254·04	−0·55
29	342·268	175·076	−0·500	35·79	·24	33·49	9·46	253·95	−0·53
31	342·156	175·425	−0·483	35·96	·25	33·65	9·64	253·86	−0·52
Apr. 2	342·046	175·766	−0·466	36·14	·26	33·82	9·81	253·77	−0·50
4	341·939	176·102	−0·449	36·33	·27	33·99	9·97	253·68	−0·48
6	341·835	176·428	−0·432	36·52	·28	34·17	10·13	253·59	−0·46
8	341·734	176·748	−0·415	36·71	·29	34·35	10·28	253·50	−0·44
10	341·637	177·060	−0·398	36·91	·30	34·53	10·42	253·42	−0·43
12	341·543	177·363	−0·381	37·12	·31	34·72	10·55	253·34	−0·41
14	341·452	177·659	−0·365	37·32	·32	34·92	10·67	253·27	−0·39
16	341·364	177·946	−0·349	37·53	·33	35·12	10·79	253·20	−0·37
18	341·279	178·223	−0·333	37·75	·34	35·32	10·89	253·13	−0·36
20	341·197	178·492	−0·317	37·97	·34	35·52	10·99	253·06	−0·34
22	341·119	178·753	−0·301	38·19	·35	35·73	11·08	253·00	−0·32
24	341·044	179·002	−0·286	38·41	·36	35·94	11·15	252·94	−0·31
26	340·972	179·244	−0·271	38·64	·37	36·16	11·22	252·89	−0·29
28	340·903	179·474	−0·256	38·88	·37	36·38	11·28	252·84	−0·27
30	340·837	179·696	−0·242	39·12	0·38	36·60	11·33	252·80	−0·26